D&D-35703
Revision 0

Cost Estimate for the Engineering Evaluation/Cost Analysis for BC Controlled Area Removal Action

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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Richland, Washington

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B. J. Spilman
Fluor Hanford, Inc.

Date Published
November 2007

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B. J. Spilman B J Spilman
(Print and Sign)

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G. J. McCleary Gordon J. McCleary 11/15/07
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General Counsel	☒	S. B. Cherry	S B Cherry	(Y) / N
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RESPONSIBLE CONTACTS

	Name	Phone Number
Author:	B. J. Spilman	(509) 376-5105
Manager:	G. J. McCleary	(509) 372-8385

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REVIEWERS — **Others**

Name *(print)*	Organization
J. R. Seaver	D&D Project
L. D. Stefanski	D&D Project
G. B. Chronister	Soil & Water Rem/Groundwater

APPROVAL SIGNATURES

Author: B. J. Spilman		11/26/07
Name: (Print) B. J. Spilman		11/26/07 Date
Responsible Manager: G. J. McCleary		
Name: (Print) G. J. McCleary		Date
Other:		
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TERMS

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
EE/CA	engineering evaluation/cost analysis
EPC	engineering, procurement, and construction
ERDF	Environmental Restoration Disposal Facility
FH	Fluor Hanford, Inc.
HAMTC	Hanford Atomic Metal Trades Council
IC	institutional control
MNA	monitored natural attenuation
N/A	not applicable
OMB	U.S. Office of Management and Budget
OU	operable unit
PV	Present Value
QA	quality assurance
RTD	remove, treat, and dispose
S&M	surveillance and maintenance
TPC	total project cost

COST ESTIMATE FOR THE ENGINEERING EVALUATION/COST ANALYSIS FOR BC CONTROLLED AREA REMOVAL ACTION

1.0 INTRODUCTION

1.1 Purpose/Scope

The purpose of this Present Value (PV) analysis is to evaluate the cost of removal action alternatives of the contaminated soil contained within the northern region of the BC Controlled Area. The BC Controlled Area waste site is part of the 200-UR-1 Unplanned Release Waste Group Operable Unit (OU). The northern region of the BC Controlled Area is located north of, and includes, the sand dunes that cross the controlled area from east to west. While the Northern BC Controlled Area does not include the BC Cribs and Trenches, it does include an area, referred to as "Zone A", which has the highest levels of contamination, and a "Zone B" area, which contains detectable amounts of contamination and is generally considered to be of lower risk levels.

Alternatives evaluated are:

- Alternative One: No Action
- Alternative Two: Monitored Natural Attenuation/Institutional Controls (MNA/IC)
- Alternative Three: Remove, Treat, and Dispose (RTD).

Alternatives One and Two apply to the entire Northern BC Controlled Area. Alternative Three requires an approach that proposes removal of soil [to approximately 12-inches from Zone A and from select parts (hotspots)] of Zone B.

This PV analysis will be used for the engineering evaluation/cost analysis (EE/CA) (*Engineering Evaluation/Cost Analysis for the Northern Part of the BC Controlled Area (UPR-200-E-83),* DOE/RL-2007-51) currently being prepared for the BC Controlled Area to determine the preferred removal action alternative.

1.2 Process

The PV analysis for the reference EE/CA is developed per guidance specified in EPA/540/R-00/002, "*A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*", OSWER 9355.0-75. PV analysis is a method to evaluate expenditures, either capital or Surveillance and Maintenance (S&M), which occur over different time periods. This standard methodology allows for cost comparisons of different remedial alternatives based on a single cost figure for each alternative. This single number, referred to as the present value, is the amount needed to be set aside at the initial point in time (base year) to assure that funds will be available in the future as they are needed, assuming certain economic conditions.

Consistent with guidance established by the U.S. Office of Management and Budget (OMB), PV analysis is used as the basis for comparing costs of cleanup alternatives under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) program (OMB 2006). The PV analysis is specified under CERCLA as the approach for establishing a common baseline to evaluate and compare alternatives that have costs occurring at different times, though actual costs could vary.

The present value analysis for each remedial alternative includes:

- Period of analysis

The period of analysis for the present-net-worth cost is 50 years for Alternative 2, MNA/IC and for Alternative 3, RTD.

- Cash outflows (payments) for each year of the project

Remedial action projects typically involve construction costs that are expended at the beginning of a project (e.g., capital costs) and costs in subsequent years that are required to implement and maintain the remedy after the initial construction period (e.g., annual S&M costs, periodic costs). The cost estimates for the capital and S&M expenditures provides a discriminator for deciding between similar protective and implemental alternatives for a specific waste site. Therefore, the costs are relational, not absolute costs and considered only for the evaluation of the alternatives.

NOTE: Generally, the capital cost portion uses a simplified approach, which defines the initial year as "year zero", and an equal value per year over the length of construction. However, for this EE/CA, costs do not include sunk costs from previous years (FY2007) and the cash outflows will match the variable amounts presented in the reference Project Working Schedule.

- Discount rate to use in the present value calculation

Present value costs are calculated using the real discount rate published in Appendix C of OMB Circular No., A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, effective through January 2008. A discount rate of 3.0 percent is used for all alternatives.

- Present value (PV) (and non-discounted present value)

The comparison of Present Value and non-discounted present value costs are calculated for each alternative. PV and non-discounted present value requirements are:

  - Present Value: For a stream or series of future payments, the total present value from 1 to n years would be calculated as:

$$PV_{total} = \sum_{t=1}^{t=n} \frac{X_t}{(1+i)}$$

NOTE: See EPA/540/R-00/002, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, OSWER 9355.0-75 for exact details.

- Nondiscounted cost

The nondiscounted cost method displays the total costs occurring over the entire duration of an alternative, with no adjustment (or discounting) to reflect set aside cost based on an assumed discount rate.

NOTE: Because nondiscounted costs do not reflect the changing value of funds over time, presentation of this information under CERCLA is for information purposes only, not for purposes of selecting a response action alternative. Additionally, nondiscounted constant dollar costs are not considered the same as present day costs of remedial actions found in the Hanford baseline budget.

- Contingency: (Project Management Reserve)

  Contingency is applied to the cost estimate to cover potential cost overruns. A contingency rate of 8 percent was determined from a Risk Analysis performed by FH Project personnel. Based on Analysis of the Critical Risk list, Deterministic Cost (Total Project Cost) a 50% Cost Confidence was determined to be approximately $3 million. Project Management Reserve (PMR) should be determined by the projects and planned in accordance with "Project Risk Management Planning Guidance", Document HNF-GD-29936.

- Economies

  Economies associated with implementing multiple sites or groups with a common alternative or aggregated remediation are considered in the long-range planning of the reference basis of estimate. Potential areas of cost sharing to reduce overall remediation costs include the following:
  - Remediating all waste sites with a common preferred alternative at the same time
  - Sharing mobilization/demobilization costs
  - Sharing S&M costs
  - Sharing operation and maintenance costs
  - Sharing training costs.

Chapter 2.0 provides a basic breakdown of the cost types used to determine each alternative's present value costs.

Chapter 3.0 provides the level of detail necessary for independent review. The supporting capital, periodic and annual cost estimates prepared by Fluor Hanford, Inc. (FH) Project Controls Estimating department shall include a basis of estimate in accordance with Job bulletin # 7, "Work Instructions for Cost Estimate Development and Review", Rev 1 (6/2007).

2.0 ALTERNATIVE COST ESTIMATES

This chapter summarizes each alternatives scope and cost components used for determining their present value in terms of the remedial alternatives developed in the EE/CA.

List of alternatives includes:

- Alternative One: No Action
- Alternative Two: MNA/IC
- Alternative Three: RTD.

For the purpose of this EE/CA, the present-net-worth costs represent three cost types, which may include:

- Capital
  - Remediation (RTD) Engineering, Procurement, and Construction (EPC)
  - IC (Alternative Two only).
- Periodic
  - MNA
  - IC (Alternative Three only).
- Annual:
  - S&M.

2.1 Alternative One – No Action

The no-action alternative represents a situation where no legal restrictions, access controls, or active remedial measures are applied to the waste site. Taking no action implies "walking away from the waste site" and allowing the waste to remain in its current configuration, affected only by natural processes. No maintenance or other activities would be instituted or continued. The EE/CA describes the no-action alternative.

Because the no-action alternative assumes that no further actions will be taken at a waste site, costs are assumed zero.

2.2 Alternative Two – Institutional Controls Supplemented by Monitored Natural Attenuation

Chapter 5.0 of the EE/CA provides a description of the MNA/IC alternative. The cost details for this alternative are discussed in detail in Section 3.2.

The typical annual/periodic costs associated with alternative two are; IC, S&M, and MNA costs. The costs for these annual/periodic activities are estimated based on the location and size of the individual sites.

For the purpose of this alternative IC will be considered a capital one-time occurring cost. The duration for IC only considers the initial, "Year-zero" period. The annual/periodic calculations are based on the length of time required to reach the preliminary remediation goals.

For the purpose of this EE/CA, the annual/periodic activities have been revised to include only:

- IC
  - Non-engineering or legal/administrative measures
  - IC plans
  - Restrictive covenants
  - Property easements
  - Zoning
  - Deed notices
  - Advisories
  - Groundwater use restrictions
  - Site information databases.
- S&M
  - Radiation survey of the site perimeter
  - Signage repair.
- MNA
  - Not applicable (N/A).

The combined present-net-worth costs for IC, S&M, and MNA activities represent the present value cost for this alternative.

2.3 Alternative Three – Remove, Treat and Disposal

Chapter 5.0 of the EE/CA describes the RTD alternative. The details for the RTD system life cycle costs are discussed in detail in Section C3.3.

Controlled areas are excavated to the required depth and contaminated material is removed to the Environmental Restoration Disposal Facility (ERDF) for disposal. The scope of this alternative will complete the removal of approximately 330,000 tons of soil in the BC Control Zone Waste Site (UPR-200-E-83) as identified in DOE/RL-2003-24.

- A listing of this alternative major cost components are as follows:
  - Capital
    - Remediation process system scope:
    - Project management
    - Mobilization and site preparation,
    - Regulatory document development,
    - Site soil excavation
    - Post excavation characterization
    - Re-vegetation of excavation site
    - Demobilization.
  - Periodic
    - Natural attenuation monitoring (N/A)
    - IC activities
    - Annual site review report (5 yrs).
  - S&M (N/A).

The combined present-net-worth costs for the capital construction activities and, IC activities represent the present-worth cost for this alternative.

3.0 ASSUMPTIONS

The remedial alternatives are discussed in detail in Chapters 5.0 and 6.0 of this EE/CA. This chapter provides backup information and assumptions used in developing the cost estimates of the remedial alternatives.

3.1 Global Assumptions

- General pricing is based on reference document: "FY 2008 AND LIFE-CYCLE BASELINE UPDATE PROJECT EXECUTION PLAN"' Rev 0, May 15, 2007.

- Information contained within this estimate has been derived from historical experience with the management and support of similar projects. The units utilized may have been factored / adjusted by the estimator, superintendent, senior construction engineer, and task leads, as appropriate, to reflect influences by the contract, work site, or other identified special conditions.

- The estimate includes discipline support, construction management, environmental expertise, and technical support.

- Sub-element pricing requirements specific to this EE/CA include:
  - Hanford Atomic Metal Trades Council (HAMTC) craft personnel (Plant Forces) labor rates for construction activities are fully burdened and based on approved FH planning rates for FY2008 (unescalated).
  - FH labor rates for management, engineering, safety oversight, and technical support are based on the FH approved planning rates for fiscal year 2008 (unescalated).

- The non-labor resource rates are based on the FH approved planning rates for fiscal year 2008 (unescalated).
- Markups (Direct Cost Factors/Indirect Cost Factors)
- FY2008 burdened planning rates without escalation was used.

3.2 Detailed Assumptions by Alternative

3.2.1 Alternative One - No Action

The No-Action Alternative represents a situation where no legal restrictions, access controls, or active remedial measures are applied to the waste site. Taking no action implies "walking away from the waste site" and allowing the waste to remain in its current configuration, affected only by natural processes. No maintenance or IC are included in this alternative.

Because the No-Action Alternative assumes no further actions will be taken at a waste site, costs are assumed to be zero.

3.2.2 Alternative Two - Monitored Natural Attenuation/Institutional Controls

Scope:

IC, which can have one-time or recurring costs (capital, annual operations and maintenance, or periodic), are non-engineering or legal/administrative measures to reduce or minimize the potential for exposure to site contamination or hazards by limiting or restricting site access.

Examples include IC plans, restrictive covenants, property easements, zoning, deed notices, advisories, groundwater use restrictions, and site information databases. An IC plan would describe the controls for a site and how they would be implemented. A site information database would provide a system for managing data necessary to characterize the current nature and extent of contamination. IC are project-specific costs that can be important components of a remedial alternative and as such, should generally be estimated separately from other costs, usually on a sub-element basis. IC may need to be updated or maintained, either annually or periodically.

The primary annual/periodic costs associated with this alternative are for the area perimeter radiological S&M natural attenuation. The costs for these annual/periodic activities were estimated based on the perimeter (50,000 feet) of the individual waste sites or groups.

The unit cost for S&M was assumed the same as the current unit cost for S&M activities conducted annually on the waste sites. The unit cost accounts for such activities as site radiation surveys, and repair of signage.

The costs associated with natural attenuation monitoring include radiological surveys of surface soils. The costs to perform radiological surveys of surface soils at waste sites are assumed similar to those for current survey practices at the sites and are included in the S&M costs. Costs are included for periodically replacing signs over 50-year duration.

Basis of Estimate:

The IC cost model used for this alternative was developed by the FH Project Controls and Estimating department. The duration for IC only considers the initial, "year-zero" period. The annual/periodic activities were based on 50-year duration for alternatives two and three.

General Assumptions

The general assumptions for this alternative are as follows.

- Monuments/signs for IC and signage maintenance are included.
- The IC alternative consists of the following general activities: implementation of IC, site inspection and surveillance, MNA, reporting and site reviews.
- Site Reviews will be required every 5 years.

Special Conditions

NOTE: Typical EE/CA annual/periodic costs associated with this alternative are:

- IC
  - Non-engineering or legal/administrative measures
  - IC plans
  - Restrictive covenants
  - Property easements
  - Zoning
  - Deed notices
  - Advisories
  - Groundwater use restrictions
  - Site information databases.
- S&M
  - Site radiation surveys
  - Repair of the existing soil cover.
- MNA
  - Radiological surveys of surface soils
  - Spectral gamma logging of vadose-zone boreholes
  - Long-term groundwater monitoring.

3.2.3 Alternative Three - Removal, Treatment, and Disposal

Scope:

Controlled areas are excavated to the required depth and contaminated material is removed to the Environmental Restoration Disposal Facility (ERDF) for disposal. The general remediation scope activities include:

- Capital
  - Project Management
  - Regulatory document development
  - Obtain personnel to perform the excavation
  - Complete regulatory documentation allowing excavation
  - Mobilize equipment and personnel
  - Install monitoring and surveying equipment

- Identify area with near surface contamination in Area B of the BC Controlled Area, UPR-200-E-83 (Note: This was performed as part of the 200-UR-1 OU remedial investigation activities)
- Complete excavation of Area A and Area B hot spot removal at BC Controlled Area to a depth of 1 foot and dispose of the material at ERDF
- Obtain samples and analysis
- Revegetate area
- De-mobilization
- Complete closeout documentation.

- Periodic:
  - MNA (N/A)
  - IC activities
  - Annual site review report (5 yrs).

- S&M (N/A).

The method of soil removal shall consider two (2) different approaches which create different equipment and labor mixes. The first approach is for a single mass (bulk) near surface soil excavation covering approximately 140 acres, identified as Zone A. The second approach will remove the approximately 1,000 randomly located elevated surface contamination areas "hotspots" spread out over approximately 3,700 acres. Additionally, the random excavation must consider old-growth conservation and avoid destruction of existing plant life by using the smallest footprint for sizing equipment whenever possible.

For the purpose of this estimate the production rate for each approach is:

- Mass excavation – 520 CY/Day
- Random" Spot" Excavation – 130 CY/Day.

The field work such as mob/demob, excavation, revegetation, and some for the post construction work will be contracted to the Plant Construction Forces Contractor or HAMTC. The Project Management, Radiological control technician support, sampling, and safety oversight will be performed by FH. The waste disposal work will be performed by the environmental restoration contractor responsible for ERDF.

Mobilization and startup include site training; mobilization of equipment and personnel; installation of temporary construction fences; construction of truck turnaround areas and access roads; and setting up office, change, and storage trailers with utilities, temporary survey structure, and decontamination areas.

Air sampling will be performed during the excavation of contaminated soil.

Soil sampling will be done for verification at the completion of excavation. The estimated costs include an allowance of $1 million for obtaining sample analysis.

The haul truck handling and loading process starts at a preparation area where it is inspected. The haul truck proceeds to the loading area. After loading, the bed is covered and secured. The truck is moved to the survey area where it is inspected and surveyed for contamination. From there, the haul truck is weighed on a platform scale and then driven to the ERDF where the bed is unloaded from the truck. Eight trucks with seven in continuous use are required to support each contaminated excavation crew.

ERDF disposal fee, transportation, and handling costs are included in the estimate. A driver will move loaded trucks to ERDF. The estimated costs include the rental of the trucks used. For planning purposes, the capacity of a haul truck is 26 yd^3.

No stockpile or backfill is anticipated.

Revegetation of the waste site includes planting native dry-land grass and seedlings. Disturbed site areas, such as around the waste site, staging areas, and access roads no longer needed will be replanted.

The FH Project Management team consists of a part-time project manager, with a full-time field supervisor and part-time engineering support. Quality assurance (QA), radiological control, and safety also provide oversight along with other support for contract management and project controls. The duration of this work is based on total project duration.

The FH contractor field supervisory team consists of a full-time construction manager and field supervisor, along with part-time QA, construction safety, and clerical support. The duration of this work is based on total project duration.

Demobilization includes demobilization of no longer needed equipment and personnel, removing temporary construction fences, access roads, office/change/storage trailers, temporary survey buildings, and decontamination areas.

Basis of Estimate

- The Majority of the Total Project Cost (TPC) for the capital construction scope of work for the RTD alternative of this EE/CA is based on the following references worksheets and schedules:
  - See table entitled Estimate Planning and Development (From BCR RL40-CP07-002, BC Control Area Excavation – Estimate Review Package).

- The methods used for preparing the cost estimate varied with the specific activities within the Work Breakdown Structure (WBS) (see the specific WBS Basis of Estimate). A combination of Analogy, Bottoms Up and Parametric estimating was used. In general, for Project Management and necessary engineering and regulatory documentation development analogous estimates were developed. Bottoms Up estimates were applied to field work.

- Where costs were unknown, past experience with the recent 200-W-42 pipeline removal and 200 North projects were used to estimate values.

General Assumptions:

- The general assumptions for this alternative are as follows.
  - Direct haul road will be available at no cost for soil shipment to ERDF.
  - The excavation sites will have contaminated waste removed.
  - The sides of the excavated area will be contoured to the average one-foot depth.
  - For excavation sites, overburden is not anticipated.
  - A highway truck with a water tank trailer is used to control dust during this activity.
  - No waste debris including concrete, pipe, etc. is anticipated.
  - The total volume and weight of excavated contaminated soil is approximately 236,907 CY or 326,931 tons.
  - The duration of the Total Project is approximately 990 days or 4 (four) years.
  - The estimate assumes the timely approval of regulatory documents (e.g., EE/CA, sampling and analysis plan, action memorandum, remedial action work plan, etc.) by both U.S. Department of Energy (DOE) and the lead regulatory agency.
  - Failure to attain timely approvals will cause schedule delays, cost increases and possibly missed completion dates.
  - 26 cubic yard dump trucks will be used to dispose of material to ERDF.

- ERDF will support turn around of trucks to maintain an average of 720 tons per day.
- Acquisition of dump trucks can be completed prior to need date.
- Vegetation disposal will be accepted at ERDF.
- No obstructions will be detected during ground scan and/or excavation activities.
- No follow up requirements will be required due to the cultural historic review.
- No follow up requirements will be required due to the biological/ecological review.
- PFWR will come back as Building Trades.
- Hazard Characterization will be less than CAT 3.
- The site evaluation will not identify any issues.
- A maximum of 3 environmental air monitors will be required.
- No additional cost and duration due to equipment decontamination.
- Will excavate to a maximum of one foot in depth.
- Weather and equipment downtime will not impact the schedule and will not exceed 10% of the labor cost.
- ERDF charges will not exceed the average cost per ton as calculated from the estimate provided by WCH.
- Interface with US Ecology will not impact the schedule.
- Contamination levels will not require additional monitoring and/or personal protective equipment.
- No backfill of site prior to revegetation.
- The site will be down-posted and signage removed at the end of the project.
- Revegetation was assumed to be a maximum of 22 pounds of seed and 810 seedlings per acre.
- Revegetation will not require watering.
- Site Reviews will be required every 5 years.

Table 3-1. Alternative 3 Planning and Development Basis for Estimate[1].

Excavation Crew	
Labor - Staffing plan developed by project management team with previous experience at 200-W-42 and 200 North excavation projects.	4 x 10 work week 11 teamsters (8 for direct haul trucks and 2.5 for water trucks – dust suppression) 7 laborers 2 heavy equipment operators 6 health physics technicians 1 miscellaneous support
Materials	5% of labor for consumables 124,220 hours * average labor rate of $64 per hour * 5% = $397,504
	Dust suppression equipment ($145 per day * 580 Days = $84,100)
	Soil Cement - $2,500 per month * 21 months
Other Contractors	ERDF Support ($1000 per month * 29 Months = $29,000)
	FH Package and Ship BC Control Zone to ERDF ($34.74 per ton x 326,932 tons = $11,357,618)
Fuel	2 water trucks and average 7 haul trucks @ 20 gallons per day (20 gallons per day * 580 days * $5 per gallon = $522,000)
Excavation mitigation	Allowance of 10% labor cost for weather and mechanical delays - $712,200
Adders/Overheads	

Table 3-1. Alternative 3 Planning and Development Basis for Estimate[1].

Rental Equipment	
Materials	2 water truck @ $6,941 ea = $13,882 4 Light Plants @ $588 ea = $2,352 4 Portalettes @ $470 ea = $1,880 1 100 kwv generator @ $1,765 1 scale @ $1,106 1 Front End Loader @ $13,000 Total monthly rental $33,985 ($33,985 * 29 months = $985,565) Delivery costs $15,000
	Haul trucks (8 haul trucks @ 7,500 per month * 29 months = $1,740,000)
	70,000 gallon water wagon at $20,000 a month for 23 months = $460,000
BC Crib BC Crib Control Zone Field Work Project Management	
Labor - Staffing plan developed by project management team with previous experience at 200-W-42 and 200 North excavation projects.	FGG Project Engineer (.25) Waste Coordinator (1.0) Safety (.5) Clerical (.1) Field Work Supervisor (1.0) Rad Supervisor (.5 prep/1.0 field work) Director (.1) Project Manager (.25) Project Scheduler (.25 prep/.5 field work) Project Superintendent (.75) Work Package Planner (.25) Field Health Physicist (.5) Technical Health Physicist (.1) Industrial Hygienist (.5)
Materials	5% of labor for consumables
	Trailers @ $800/month * 4 Trailers * 33 months = $105,600 Cell phone stipend @ $250 per month * 31 months = $7,750 Remote internet @ $100/month * 5 stations * 31 months = $15,500
Subcontracts	Attendance in Training - $750,960 • 19 FTEs x 596 days x 8 hours a day x 5% at $70 per hour = $317,072 • 6 HPTs and 1 HPT Supervisor x 596 days x 8 hours a day x 10% at $80 per hour = $267,008 • Plus ~7 FTE's in PM x 596 days x 8 hours a day x 5% at $100 per hour = $166,880
Other Direct Costs	Initial Training Course Cost - $50,000

Table 3-1. Alternative 3 Planning and Development Basis for Estimate[1].

Laboratory Analysis	
	Approximately twice the 200-W-42 Trench sampling costs have been entered as a ROM estimate. Actual post excavation sampling requirements will be determined at a later date and will require regulatory agreement.
BC Control Revegetation	
Contracts	▪ Procure: 810 seedlings per acre * $.50 per seedling * 150 acres = $60,750 ▪ Plant: 810 seedling per acre * 1.20 * 150 acres = $145,800 ▪ Seed with mulch and fertilizer 22 pounds per acre * $70.00 per pond * 150 acres = $231,000

[1] From BCR RL40-CP07-002, BC Control Area Excavation - Estimate Review Package

3.2.4 Special Conditions

Alternative 3 costs includes adjustment of the reference estimate to meet the capital cost requirements specific to this EE/CA resulted in a Total Capital Cost of.$38,180,900 (Table 3-2).

Table 3-2. Adjusted Total Capital Cost from Referenced Estimate[1]

CAPITAL COST[1]	PERIOD
$4,157,173	YEAR 0
$14,431,542	YEAR 1
$14,595,331	YEAR 2
$4,996,854	YEAR 3
$38,180,900[2]	Total Capital Cost

[1] From BCR RL40-CP07-002, BC Control Area Excavation - Estimate Review Package
[2] Total Capital Costs reflects the following:
- Added revegetation costs ($540,000) (YEAR 3), for increased area based on an estimated replacement ratio - 3:1 for compensatory mitigation.
- Includes Project Management Reserve (contingency) $3,100,000.
- Deducted the haul road construction cost ($355,300) (YEAR 0).

Cost adjustments were made for revegetation, project management reserve and the haul road to ERDF, as summarized below.

Revegetation

A replacement ratio - 3:1 for compensatory mitigation was estimated based on an initial review. Specific resources that will be subject to mitigation of adverse impacts are defined in the "Biological Resources Management Plan", (BRMaP) for the Hanford Site.

Contingency - (Project Management Reserve)

The contingency rate was determined from a Risk Analysis performed by FH Project personnel. Project personnel and risk analysis facilitators assessed the BC Controlled Area Excavation work scope for exposure to risk and events that could cause the activity to exceed budgeted cost and schedule. The cost

and schedule confidence curves generated from the analysis display the probability of completing the project within the planned baseline and provide the basis to develop project management reserve.

The probability of completion of the lifecycle scope by August 26, 2011 is 50%. The probability of completion of the lifecycle scope within the $35M unescalated budget is less than 1%. The application of $3,100K of PMR will raise the cost confidence to the 50% desired level.

Haul Roads

The construction of a haul road between the BC Controlled area and the ERDF site is not included in the scope of the EE/CA. Detail costs of the haul road cost deductions are shown in the following Table 3-3:

Table 3-3. Total Costs of Haul Road not included in the BC Controlled Area Alternative 3 Costs.

CCL	Act ID	Data	($000)	
			FY2008	Grand Total
4.01.02.09 - Waste Site Remediation	BC0300 - Complete Prep for Haul Road	Sum of subtotal_burdened	32.7	32.7
		Sum of esc	0.0	0.0
		Sum of total_escalated	32.7	32.7
	BC0310 - Construct Haul Road	Sum of subtotal_burdened	322.6	322.6
		Sum of esc	0.0	0.0
		Sum of total_escalated	322.6	322.6
4.01.02.09 - Waste Site Remediation Sum of subtotal_burdened			355.3	355.3

3.3 Cost Summary Tables for Alternatives 2 and 3 for the BC Controlled Area

Tables 3-4 and 3-5 provide the summaries of the capital costs, periodic costs, non-discounted costs and present worth costs for Alternative 2 and Alternative 3.

Table 3-4. Site Summary Sheet for Alternative 2- Monitor Natural Attenuation and Institutional Controls.

Site	Alternative	Total Capital Cost	Non-Discounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
BC CONTROLLED AREA	Alt 2 – MNA/IC[1]	$35,400	$1,839,583[2,3]	$1,874,983 [3]	$976,051

[1] This alternative includes an annual perimeter survey of the BC Controlled Area Zone A and selected Zone B "hot spot" area, signage and reporting. Institutional controls (IC) typically include an IC plan, restrictive covenants, property easements, zonings, deed notices, advisories, groundwater use restrictions, site reviews, and site information databases.

[2] There is no existing clean soil cover and therefore no maintenance of the soil cover or additions of clean soil. No Vadose Zone or Ground Water Monitoring will be priced.

[3] Discount rate is a calculated annual multiplier of 3.0% and n = year (1 - 50).

Table 3-5. Site Summary Sheet for Alternative 2 – Remove, Treat, and Dispose.

Site	Alternative	Total Capital Cost [3]	Non-Discounted Annual & Periodic Cost	Non-Discounted Cost	Total Present Worth Cost
BC CONTROLLED AREA	Alt 3 - Remove Treat and Disposal[1, 2]	$38,180,900	$180,000[4]	$38,360,900	$36,583,609

[1] The RTD alternative includes the RTD of BC Controlled Area Zone A and selected Zone B higher contamination "hot spot" areas.
[2] Alternative also includes institutional controls (IC) typically include an IC plan, restrictive covenants, property easements, zonings, deed notices, advisories, groundwater use restrictions, site reviews, and site information databases.
[3] Total Capital Cost based on Table 3-2.
[4] There is no existing clean soil cover and therefore no maintenance of the soil cover or additions of clean soil. No Vadose Zone or Ground Water Monitoring will be priced.
[5] Discount rate is a calculated annual multiplier of 3.0% and n = year (1 - 50).

4.0 SUMMARY OF COST FOR THE ENGINEERING ESTIMATE/COST ANALYSIS FOR BC CONTROLLED AREA (UPR-200-E-83) REMOVAL ACTION

The summary of the cost estimates for Alternatives 2 and 3 for the BC Controlled Area EE/CA is provided in Table 4-1.

Table 4-1. Cost Estimates for BC Controlled Area Removal Alternatives.

Cost Estimate	Alternative 1: No Action	Alternative 2: Monitored Natural Attenuation and Institutional Controls	Alternative 3: Remove, Treat, and Dispose
Present Net Worth	$0	$976,051	$36,583,609
Non-Discounted Cost	$0	$1,874,983	$38,360,900

5.0 REFERENCES

DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C.

DOE G 435.1-1, 1999, *Implementation Guide for Use with DOE M 435.1-1*, U.S. Department of Energy, Washington, D.C.

DOE/RL-2007-51, *Engineering Evaluation/Cost Analysis for the Northern Part of the BC Controlled Area (UPR-200-E-83)*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA/540/R-00/002, 2000, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, OSWER 9355.0-75, U.S. Environmental Protection Agency, Washington, D.C.

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OMB Circular No. A-94, 2002, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Office of Management and Budget, Washington, D.C., as revised.

Richardson's Process Plant Construction Estimating Standards, Richardson Engineering Services, Inc., Mesa, Arizona.

Rental Rate Blue Book for Construction Equipment, 2007, Equipment Watch, San Jose, California.

Site Stabilization Agreement for All Construction Work for the U.S. Department of Energy at the Hanford Site, 1984, as amended, commonly known as the Hanford Site Stabilization Agreement (original title, Site Stabilization Agreement, Hanford Site, between J. A. Jones Construction Services Company and Morrison-Knudsen Company, Inc., and the Building and Construction Trades Department of the AFL-CIO and its affiliated international unions, and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers of America).

Social Security Act of 1935, 26 USC 21, et seq. (Federal Insurance Contributions Act).